26. (New) The demineralization fluid treatment system of claim 24 in which said flow restrictors in a form of a tube.

27. (New) The demineralization fluid treatment system of claim 24 in which said flow restrictor has a cylindrical wall.

28. (New) The demineralization fluid treatment system of claim 27 in which said flow restrictor is concentrically mounted within said screen.

29. (New) The demineralization fluid treatment system of claim 27 wherein the at least one orifice is disposed at an angle non-perpendicular to the axis of the cylindrical wall.

30. (New) The demineralization fluid treatment system of claim 27 in which said flow restrictor includes a plurality of said orifices circumferentially about the wall thereof.

31. (New) The demineralization fluid treatment system of claim 27 in which said at least one orifice is disposed generally perpendicularly to a central axis of the cylindrical wall.

REMARKS

The specification and claims have been carefully reviewed in the light of the Office Action to which this amendment is responsive. By this amendment, a new independent claim 24 directed to the apparatus has been submitted which has approved form and which distinguishes even more clearly over the prior art, The process claim 17 similarly has been amended to more clearly cover applicant's invention. The remaining claims as now presented all are in dependent form.

Claims 1, 4-8, 17, 18, 21 and 22 have been rejected as being anticipated by Deutsche U.S. patent 482,436; claims 1, 4, 5, 17, 18, 21 and 22 have been rejected or alternatively rejected as being anticipated by Weis et al. U.S. patent 3,730,348; claims 2, 3, 9, 10, 19 and 23 have been rejected, or alternatively rejected as being obvious over Deutsche; claims 2, 3, 6-10, 19, and 23 have been rejected, or alternatively rejected as being obvious over Weis et al.; and claims 12-16 and 20 have been rejected as being obvious over Duden U.S. patent 1,784,893 in view of Deutsche or Weis et al. Reconsideration of such rejections is respectfully rejected in the light of the foregoing amendments.

Applicant has disclosed and claimed herein an improved apparatus and method for demineralizing process fluids. The apparatus includes a manifold having a plurality of nozzles suspended in an ion exchange demineralizing processing medium, each comprising a screen which defines an internal cavity and a plurality of screen openings and a hollow flow restrictor disposed within the screen cavity and having one or more orifices communicating between the internal cavity and a fluid exit duct. In accordance with an important aspect of the invention, the restrictor orifices have a collective area substantially less than the collective area of the screen openings such that during operation of the treatment system a fluid flow rate through the nozzles is controlled by the restrictor and a pressure differential is created across the restrictor orifices sufficient for generating a directional flow of the processing fluid in the internal cavity and through the restrictor orifices. Because the flow rate of the nozzles is not a function of the screen opening area, variations in flow rate from screen clogging are substantially reduced. Moreover, because the restrictor orifices do not perform a physical filtering function, the orifices may be sufficiently large to prevent clogging from possible solids in the processing fluid. As brought out in the specification, the restrictor may be designed to resist wear substantially better than the external more fragile screen. Moreover, restrictor orifices may be designed to direct and concentrate fluid flow -- by reason of the pressure differential across the restrictor -- to particular or preferred portions of the exterior screen and the surrounding processing medium for optimum processing efficiency.

In contrast, Deutsche patent 482,436 relates to a filter and not to a fluid demineralizing method and apparatus. Nor is the nozzle suspended within an ion exchange demineralizing processing medium, but rather is embedded in part within a concrete base. Moreover, there is no teaching with respect to the relationship between the open area of the embedded tubular member and the internal tubular member, and certainly no suggestion of forming the apertures in an internal restrictor sufficiently small so that internal tube controls and directs the process fluid flow in a manner for optimum demineralization. Indeed, the internal tube in Deutsche is mounted in contact on the bottom embedded unapertured side of the outer tube which teaches away from applicant's invention.

Weis et al. patent 3,730,348 also relates to a filtration device, rather than a fluid demineralization apparatus. This reference also lacks any teaching or suggestion of the claimed relationship in the areas and function of the orifices of the internal member and screen orifices. Indeed, the internal pipe orifices in Weis et al. appear to define significantly larger open areas. Duden patent 1,784,893, as well as the other prior art of record, is believed to bear no relevance to applicant's invention.

The claims as now presented all are believed to patentably distinguish over the prior art so as to be in condition for allowance. Indeed, independent claim 17 is directed to a demineralization fluid treatment system which includes a hollow flow restrictor within the screen having at least one orifice formed in a wall thereof which has a collective orifice area less than the collective open area of the surrounding screen such that during operation of the treatment system the fluid flow rate through the nozzle is controlled by the flow restrictor and a pressure differential created across the at least one orifice is sufficient for generating a directional fluid flow in the internal cavity between the restrictor and the surrounding screen, which enables more efficiently controlled processing, and more effective utilization of the demineralizing processing medium. Independent claim 17 is directed to a process which specifically calls for drawing processing fluid through the at least one smaller orifice area of the restrictor during processing for creating a pressure differential across the one restrictor opening such that a

distinct distructional flow of process fluid is caused through the at least one orifice and in said cavity, which similarly enables more efficient operation of the system.

From the foregoing, it is believed that the claims as now presented all are in condition for allowance. Accordingly, an early action to that effect is respectfully requested.

Respectfully submitted,

Dennis R. Schlemmer, Reg. No. 24,703
LEYDIG, VOIT & MAYER, LTD.
Two Prudential Plaza, Suite 4900
180 North Stetson
Chicago, Illinois 60601-6780
(312) 616-5600 (telephone)
(312) 616-5700 (facsimile)

Date: January 3, 2003

In re Appln. of Pandya
Application No. 09/710,460

CERTIFICATE OF MAILING

I hereby certify that this RESPONSE TO OFFICE ACTION (along with any documents referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

Date: Jan 3, 2003

PATENT
Attorney Docket No. 206248

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Ken V. Pandya

Application No. 09/710,460

Filed: November 10, 2000

Art Unit: 1724

Examiner: Cintins, Ivars C.

For: FILTER SCREEN NOZZLE AND SYSTEM FOR FLUID PROCESSING

AMENDMENTS TO CLAIMS
MADE IN RESPONSE TO OFFICE ACTION DATED SEPTEMBER 4, 2002

IN THE CLAIMS:

Cancel claims 1, 2, 4, 5, 9, 12, 14-16, 20, 21, and 23, without prejudice.

Amendments to claims 3, 6, 7, 8, 10, 11, 13 and 17.

3. (Amended) The [nozzle according to] demineralization fluid treatment system of claim [2] 24, wherein the orientation of the at least one orifice is such that a flow of fluid from the orifice into the cavity is directed toward a bottom portion of the screen.

6. (Amended) The [nozzle according to] demineralization fluid treatment system of claim [1] 24, wherein the screen is generally cylindrical, the nozzle further comprising an end cap mounted to a bottom of the screen.

7. (Amended) The [nozzle according to] demineralization fluid treatment system of claim [1] 24, wherein the screen is generally cylindrical, the nozzle further comprising an end cap mounted to a bottom of the screen, wherein the restrictor further comprises an end wall mounted to an end [of the tube] thereof, the end wall being spaced from the end cap.

8. (Amended) The [nozzle according to] demineralization fluid treatment system of claim [1] 24, wherein the screen is generally cylindrical, the nozzle further

comprising an end cap mounted to a bottom of the screen, and wherein the generally cylindrical wall extends to the end cap.

10. (Amended) The [nozzle according to] demineralization fluid treatment system of claim [9] 13, wherein the auxiliary restrictor includes a tube positioned within the interior cavity, the at least one orifice being disposed in the wall.

11. (Amended) The [nozzle according to] demineralization fluid treatment system of claim 10, wherein the auxiliary restrictor further includes a check valve mounted upstream of the tube to permit one-way flow away from the auxiliary orifice.

13. (Amended) The [invention according to] demineralization fluid treatment system of claim [12] 24, wherein each of the nozzles further includes an auxiliary duct, an auxiliary restrictor having at least one auxiliary orifice providing communication between the auxiliary duct and the interior cavity, and wherein the vessel further comprises an auxiliary manifold in communication with the auxiliary duct.

17. (Amended) A process for [treating] demineralizing a fluid[, the process] comprising the steps of:

providing a vessel having an inner chamber[, the chamber] containing an ion exchange demineralizing processing [a processing] medium through which fluid can pass;

introducing the process fluid into the chamber [above the medium];

providing a manifold including a plurality of nozzles suspended in said demineralizing medium in communication with an outlet, each of the nozzles including an outer screen defining an interior cavity, the screen having a plurality of screen openings having a collective screen opening area, a duct, and a hollow flow restrictor disposed in said interior cavity having at least one orifice providing fluid communication between the duct and the interior cavity, [the at] said least one orifice being positioned generally within the interior cavity and having a collective orifice area less than the screen opening area; and

drawing process fluid through the at least one orifice of said restrictor during processing for creating a pressure differential across said at least one restrictor opening such that a distinct directional flow of said fluid is caused through said at least one orifice and in said internal cavity

[withdrawing fluid from the medium into the nozzle through the screen openings so that the fluid flows across the interior cavity, through the orifice and into the duct].

Add the following new claims 24-31:

24. (New). A demineralization fluid treatment system comprising:

a vessel, a granular ion exchange demineralizing processing medium located in at least a lower portion of the vessel;

a first manifold for introducing fluid into the vessel; and

a second manifold for withdrawing fluid from the medium, said second manifold including a fluid exit duct, and a plurality of nozzles suspended in the demineralizing medium, said nozzles each being in communication with the fluid exit duct, said nozzles each having an external screen defining an internal cavity, said screen having a plurality of screen openings immersed in said demineralizing processing medium defining a collective exterior open area communicating with said internal cavity, a flow restrictor in the form of a hollow conduit within said interior cavity, said flow restrictor having at least one orifice formed in a wall thereof for permitting communication of fluid between said internal cavity and said duct, and said at lease one orifice collectively having a total orifice area less than the collective open area of such screen such that during operation of the treatment system the fluid flow rate through the nozzle is controlled by said restrictor and a pressure differential created across the at least one orifice is sufficient for generating a directional fluid flow in said internal cavity and through the at least one orifice.

25. (New) The demineralization fluid treatment system of claim 24 in which said nozzles are suspended in closely spaced relation to a bottom of said vessel.

26. (New) The demineralization fluid treatment system of claim 24 in which said flow restrictors in a form of a tube.

27. (New) The demineralization fluid treatment system of claim 24 in which said flow restrictor has a cylindrical wall.

28. (New) The demineralization fluid treatment system of claim 27 in which said flow restrictor is concentrically mounted within said screen.

29. (New) The demineralization fluid treatment system of claim 27 wherein the at least one orifice is disposed at an angle non-perpendicular to the axis of the cylindrical wall.

30. (New) The demineralization fluid treatment system of claim 27 in which said flow restrictor includes a plurality of said orifices circumferentially about the wall thereof.

31. (New) The demineralization fluid treatment system of claim 27 in which said at least one orifice is disposed generally perpendicularly to a central axis of the cylindrical wall.

PATENT
Attorney Docket No. 206248

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Ken V. Pandya

Application No. 09/710,460

Filed: November 10, 2000

Art Unit: 1724

Examiner: Cintins, Ivars C.

For: FILTER SCREEN NOZZLE AND SYSTEM FOR FLUID PROCESSING

PENDING CLAIMS AFTER AMENDMENTS MADE IN RESPONSE TO OFFICE ACTION DATED SEPTEMBER 4, 2002

3. The demineralization fluid treatment system of claim 24, wherein the orientation of the at least one orifice is such that a flow of fluid from the orifice into the cavity is directed toward a bottom portion of the screen.

6. The demineralization fluid treatment system of claim 24, wherein the screen is generally cylindrical, the nozzle further comprising an end cap mounted to a bottom of the screen.

7. The demineralization fluid treatment system of claim 24, wherein the screen is generally cylindrical, the nozzle further comprising an end cap mounted to a bottom of the screen, wherein the restrictor further comprises an end wall mounted to an end thereof, the end wall being spaced from the end cap.

8. The demineralization fluid treatment system of claim 24, wherein the screen is generally cylindrical, the nozzle further comprising an end cap mounted to a bottom of the screen, and wherein the generally cylindrical wall extends to the end cap.

10. The demineralization fluid treatment system of claim 13, wherein the auxiliary restrictor includes a tube positioned within the interior cavity, the at least one orifice being disposed in the wall.

11. The demineralization fluid treatment system of claim 10, wherein the auxiliary restrictor further includes a check valve mounted upstream of the tube to permit one-way flow away from the auxiliary orifice.

13. The demineralization fluid treatment system of claim 24, wherein each of the nozzles further includes an auxiliary duct, an auxiliary restrictor having at least one auxiliary orifice providing communication between the auxiliary duct and the interior cavity, and wherein the vessel further comprises an auxiliary manifold in communication with the auxiliary duct.

17. A process for demineralizing a fluid comprising the steps of:

providing a vessel having an inner chamber containing an ion exchange demineralizing processing medium through which fluid can pass;

introducing the process fluid into the chamber;

providing a manifold including a plurality of nozzles suspended in said demineralizing medium in communication with an outlet, each of the nozzles including an outer screen defining an interior cavity, the screen having a plurality of screen openings having a collective screen opening area, a duct, and a hollow flow restrictor disposed in said interior cavity having at least one orifice providing fluid communication between the duct and the interior cavity, said least one orifice being positioned generally within the interior cavity and having a collective orifice area less than the screen opening area; and

drawing process fluid through the at least one orifice of said restrictor during processing for creating a pressure differential across said at least one restrictor opening such that a distinct directional flow of said fluid is caused through said at least one orifice and in said internal cavity.

18. The process according to claim 17 further comprising:

ceasing the introducing of process fluid;

introducing a reconditioning fluid into the medium; and

withdrawing the reconditioning fluid into the nozzle through the screen openings so that the fluid flows across the interior cavity, through the at least one orifice and into the duct.

19. The process according to claim 17, further comprising:

providing the nozzle with an auxiliary duct and an auxiliary restrictor having at least one auxiliary orifice with a total orifice area less than the screen opening area, the orifice providing fluid communication between the auxiliary duct and the interior cavity;

ceasing the introducing of process fluid;

introducing a reconditioning fluid into the medium; and

withdrawing the reconditioning fluid into the nozzle through the screen openings so that the fluid flows across the interior cavity, through the at least one auxiliary orifice and into the auxiliary duct.

22. The process according to claim 21, further comprising the step of forcing liquid outwardly through the screen openings to clean the openings.

24. A demineralization fluid treatment system comprising:

a vessel, a granular ion exchange demineralizing processing medium located in at least a lower portion of the vessel;

a first manifold for introducing fluid into the vessel; and

a second manifold for withdrawing fluid from the medium, said second manifold including a fluid exit duct, and a plurality of nozzles suspended in the demineralizing medium, said nozzles each being in communication with the fluid exit duct, said nozzles each having an external screen defining an internal cavity, said screen having a plurality of screen openings immersed in said demineralizing processing medium defining a collective exterior open area communicating with said internal cavity, a flow restrictor in the form of a hollow conduit within said interior cavity, said flow restrictor having at least one orifice formed in a wall thereof for permitting communication of fluid between said internal cavity and said duct, and said at lease one orifice collectively having a total

orifice area less than the collective open area of such screen such that during operation of the treatment system the fluid flow rate through the nozzle is controlled by said restrictor and a pressure differential created across the at least one orifice is sufficient for generating a directional fluid flow in said internal cavity and through the at least one orifice.

25. The demineralization fluid treatment system of claim 24 in which said nozzles are suspended in closely spaced relation to a bottom of said vessel.

26. The demineralization fluid treatment system of claim 24 in which said flow restrictors in a form of a tube

27. The demineralization fluid treatment system of claim 24 in which said flow restrictor has a cylindrical wall.

28. The demineralization fluid treatment system of claim 27 in which said flow restrictor is concentrically mounted within said screen.

29. The demineralization fluid treatment system of claim 27 wherein the at least one orifice is disposed at an angle non-perpendicular to the axis of the cylindrical wall.

30. The demineralization fluid treatment system of claim 27 in which said flow restrictor includes a plurality of said orifices circumferentially about the wall thereof.

31. The demineralization fluid treatment system of claim 27 in which said at least one orifice is disposed generally perpendicularly to a central axis of the cylindrical wall.